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BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Other West African Countries

UNITED STATES DEPARTMENT OF THE INTERIOR

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UNITED STATES DEPARTMENT OF THE INTERIOR • Manuel J. Lujan, Jr., Secretary

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The Mineral Industry of Other West African Countries

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BENIN

The mineral industry of Benin continued to be confined to the production of cement, crude oil, salt, and sand and gravel. Only crude oil and cement were exported, with the value of crude oil exports and cement exports constituting about 20% and 2% of export revenue, respectively. The value of crude oil exports was less than the cost of imports of refined petroleum products.

Production of crude oil was unchanged from 1986, averaging 5,500 barrels per day (bbl/d). The Government managed the facilities at the Semé Oilfield while actively seeking a new manager to replace Pan Ocean Oil Co. of Switzerland, whose contract was canceled in 1986. Recoverable reserves of crude oil were estimated to be between 18 and 30 million barrels.

Benin's three operating cement plants had a combined capacity of 1 million tons per year, but were producing well below that level. The most recently constructed of the three, the Société des Ciments d'Onigbolo, was built as a joint venture with Nigeria, and most exports of cement were purchased by Nigeria.

Table 1.—Other countries of West Africa: Production of mineral commodities[1]

Country[2] and commodity[3]	1983	1984	1985	1986[p]	1987[e]
BENIN					
Cement, hydraulic[4] metric tons	300,000	300,000	300,000	300,000	300,000
Petroleum, crude thousand 42-gallon barrels	1,000	2,500	3,000	2,000	2,000
Salt, marine[e] metric tons	100	100	100	100	100
BURKINA FASO (formerly Upper Volta)					
Gold[e] troy ounces	—	500	50,000	60,000	80,000
Phosphate rock[e] thousand tons	3	3	3	3	3
Stone: Marble[e] cubic meters	—	50	100	100	100
Pumice and related volcanic materials[e] metric tons	10,000	10,000	10,000	10,000	10,000
Salt do.	6,500	6,500	6,500	6,500	6,500
IVORY COAST					
Cement[4] thousand metric tons	636	536	679	776	[5]653
Diamond[e 6]	NA	25,000	20,000	13,000	21,000
Gold troy ounces	—	—	—	—	210
Petroleum:[7]					
Crude thousand 42-gallon barrels	8,760	9,960	8,060	6,600	6,200
Refinery products:					
Gasoline do.					
Kerosene and jet fuel do.					
Distillate fuel oil do.	NA	NA	NA	NA	NA
Residual fuel oil do.					
Liquefied petroleum gas do.					
Refinery fuel and losses do.					
Total do.	NA	NA	NA	NA	NA
MALI					
Cement, hydraulic metric tons	[e]20,000	25,365	19,005	20,000	22,000
Gold, mine output, Au content[e 8] troy ounces	13,000	[5]16,075	[5]16,075	16,100	22,500
Phosphate rock[e] metric tons	10,000	3,250	[5]3,000	3,000	30,000
Salt[e] do.	4,500	4,500	4,500	4,500	4,500
Stone: Marble do.	NA	758	769	750	200
NIGER					
Cement, hydraulic do.	38,000	38,000	38,000	38,000	40,000
Coal do.	118,609	123,644	150,635	150,000	164,000
Gypsum[e] do.	3,000	3,000	3,000	30,000	NA
Molybdenum concentrate, Mo content[e] do.	40	33	20	20	15
Phosphate rock do.	1,000	1,000	1,000	1,000	—
Salt[e] do.	3,000	3,000	3,000	3,000	3,000
Tin, mine output, Sn content do.	40	76	[e]100	80	110
Uranium concentrate, U_3O_8 content do.	4,041	3,276	3,236	3,200	3,000
SENEGAL					
Cement, hydraulic do.	394,916	384,821	406,890	360,000	372,000
Clays: Fuller's earth (attapulgite) do.	100,375	115,498	95,957	81,857	11,048
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	484	546	[e]540	550	800
Jet fuel and kerosene do.	442	401	[e]400	400	576
Distillate fuel oil do.	538	675	[e]680	650	1,270
Residual fuel oil do.	566	786	[e]790	750	1,395
Other do.	20	23	[e]20	20	43
Refinery fuel and losses do.	137	233	[e]230	230	213
Total do.	2,187	2,664	[e]2,660	2,600	4,297
Phosphate rock and related products:					
Crude:					
Aluminum phosphate thousand metric tons	1,187	279	355	131	191
Calcium phosphate do.	1,254	1,932	1,814	1,850	1,874
Manufactured:					
Aluminum phosphate, dehydrated do.	144	142	200	60	89
Other[9] do.	3	7	8	5	4
Salt[e] metric tons	170,000	165,000	[5]160,000	[5]145,000	100,000

See footnotes at end of table.

Table 1.—Other countries of West Africa: Production of mineral commodities[1] —Continued

Country[2] and commodity[3]		1983	1984	1985	1986[p]	1987[e]
TOGO						
Cement products:						
Clinker	thousand metric tons	693	154	—	—	—
Cement[10]	do.	232	243	284	348	370
Iron and steel:[6]						
Crude	do.	2	—	—	—	—
Semimanufactures	do.	2	—	[5]7	[5]9	12,094
Phosphate rock, beneficiated product	do.	2,010	2,400	2,450	[5]2,208	2,544
Stone: Marble, dimension	square meters	5,177	5,317	[11]5,671	5,000	10,800

[e]Estimated. [p]Preliminary. NA Not available.
[1]Includes data available through Sept. 25, 1987.
[2]In addition to the countries listed, The Gambia and Guinea-Bissau, which are covered in the text of this chapter, presumably produced a variety of crude construction materials (clays, sand and gravel, and stone) and may produce gypsum, lime, and salt, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.
[3]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) presumably is produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.
[4]Output based entirely on imported clinker.
[5]Reported figure.
[6]Does not include smuggled diamonds.
[7]Data are for year ending July 30 of that stated.
[8]Production for Soviet-Malian Mine.
[9]Products marketed under the trade names "Balifos" and "Phospal."
[10]In 1984, production of domesitic clinker ended, and in 1986, all cement was produced from clinker imported from Western Europe.
[11]The Société Togolaise de Marbrerie et de Matériaux produced 1,205 metric tons of marble block in 1985.

BURKINA FASO

The mining industry in Burkina Faso continued to focus principally on gold, despite notable deposits of several other minerals. Unavailability of financing and the lack of an adequate countrywide transportation infrastructure precluded further development. The only other minerals produced were small quantities of marble and phosphate rock.

Although exports of gold provided a boost to export revenues in 1986 and 1987, probably making up about 20% of the value of total exports in both years, the economy remained stagnant as a result of droughts and a slowdown in private investment.

COMMODITY REVIEW

Metals.—*Gold.*—The Société de Recherches et d'Exploitation Minières du Burkina (SOREMIB) entered its third full year of production at the Poura gold mine southwest of the capital, Ouagadougou. The Poura deposit had been exploited between 1959 and 1966, before closing because of depleted reserves. SOREMIB, a joint venture between the Government, 60%; the Islamic Development Bank, 20%; and Cie. Française des Mines S.A. (Coframines), a subsidiary of Bureau de Recherches Géologiques et Minières (BRGM) of France reopened the mine in late 1984 on the basis of the discovery of additional reserves. Although official production figures have not been released, output from Poura accounted for almost all of Burkina Faso's gold production.

Investigation of several other gold prospects continued, including studies of deposits at Sebba and Dori-Yalogo. However, the only gold production, other than from Poura, was by small-scale, artisanal workers. All official gold sales were made through the Government, which controlled exports of gold.

Silver and Zinc.—Feasibility studies were continued on the zinc-silver deposit at Perkoa, about 150 kilometers west of Ouagadougou, and within 40 kilometers of the main railway linking Burkina Faso with the Atlantic Ocean at Abidjan, in the Ivory Coast. The deposit was estimated to contain 10 million tons of ore with up to 20% zinc and with silver grading as high as 60 grams (1.93 troy ounces) per ton.

Industrial Minerals.—The Cie. Voltaique d'Exploitation Minière, formed in 1982, pro-

duced small quantities of marble from its quarry at Tiara. Reserves at the quarry were estimated to be 60,000 cubic meters.

CAPE VERDE ISLANDS

There was no change in the limited mineral industry of Cape Verde. Production of mineral commodities was confined to small quantities of pozzolana, pumice, and salt, of which salt was the only export commodity. Portugal remained Cape Verde's principal trading partner, accounting for more than 50% of both imports and exports.

THE GAMBIA

Offshore seismic studies continued in an effort to locate potential sites for crude oil exploration. A consortium of U.S. oil companies headed by Aracca Petroleum carried out seismic studies over a 3,300-square-kilometer area. An aerial photography program, sponsored by the U.S. Agency for International Development, was completed, and the results were planned to be used in the preparation of geologic maps.

GUINEA-BISSAU

The Government of Guinea-Bissau embarked on a 3-year program of financial reorganization and economic recovery in 1986, with the deregulation of trade, devaluation of the national currency, and a reduction of the debt-service burden as the principal objectives. In May 1987, the Guinean peso was devalued to match parallel market levels, and negotiations on debt rescheduling were begun with creditor nations and international banking agencies. A $40 million[2] structural adjustment loan was granted by the International Bank for Reconstruction and Development, and other economic concessions and debt reschedulings were negotiated with the International Monetary Fund and the Paris Club.

Guinea-Bissau also began negotiations with the West African Monetary Union (UMOA), as the first stage in becoming part of the franc zone, whereby it would begin using Communauté Financière Africaine francs (CFAF) as official currency. The advantage to such an affiliation would be that CFAF are freely convertible with French francs and would help stabilize the banking system.

Production of mineral commodities was limited to undocumented quantities of building materials destined for local markets.

IVORY COAST

The mineral industry remained a minor aspect of the economy of the Ivory Coast. Petroleum production declined for the third consecutive year and available information indicated that Ivorian oil was scattered in small deposits in deep water. Diamond production showed no significant increase and continued to suffer through illicit export. Production of cement depended on imports of clinker and decreased in comparison with that of 1986. The only industry with any apparent promise of future foreign-exchange earnings was gold mining, in which there has been revived interest since 1985.

After 2 years of economic upturn during 1985 and 1986, the economy of the Ivory Coast suffered a major setback in late 1986, when commodity prices slumped for coffee and cocoa, major revenue earners for the Ivory Coast. The slump followed closely in the wake of debt rescheduling and the approval of new loans from international banking agencies, which were predicated on the basis of earlier commodity prices. Decreased revenues affected the ability of the Ivory Coast to make scheduled debt payments in 1987. The Government suspended debt payments in May, pending new agreements with creditors based on the modified circumstances. Foreign debt was estimated to be slightly less than $8 billion.[3]

After economic growth of 5.3% in 1986, the economy showed little real growth in 1987, as a result of cutbacks in Government spending and slowdowns in the development of new projects and investments. The balance of trade, while remaining positive, decreased substantially, with exports valued at about $3.4 billion, and imports estimated to be $2.7 billion. France continued to be the Ivory Coast's main trading partner, supplying almost one-third of Ivorian

imports and receiving about 17% of Ivorian exports. Other major trading partners, in order of decreasing importance, were: the United States, the Federal Republic of Germany, Nigeria, and Japan.

COMMODITY REVIEW

Metals.—*Copper and Nickel.*—The Government mining company, Société pour le Développement Minière de la Côte d'Ivoire (SODEMI), continued exploration of a copper-nickel deposit at Sampleu-Gangbapleu in the region of Biankouma. Seventeen boreholes totaling 1,924 meters were drilled to outline the mineralization. Additional work was required to estimate the extent of reserves.

Gold.—Official production of gold was reported to be slightly over 200 troy ounces, and exports were reported to be more than 8,000 ounces. This production probably came from artisanal miners, because none of the three operating joint ventures was in full production in 1987.

SODEMI was involved in two joint ventures with foreign mining firms. Société des Mines d'Ity, a joint venture between SODEMI, 60%, and Coframines, 40%, was formed in 1984 to exploit the Ity gold deposit near Issia, in the Toulepleu volcanic-sedimentary belt that covers southwestern Ivory Coast and overlaps into eastern Liberia. In 1987, the partners announced that the Ity project will be developed by heap-leaching technology in two phases. The $9.4 million first phase will treat the surface laterite ore at the rate of 55,000 tons per year in the first year and 115,000 tons per year for the following 6 years. The $18.5 million second phase will treat the underlying auriferous clay zone at the rate of 170,000 tons per year for 7 years. The grade of reserves at Ity was estimated at 10 grams (0.32 ounce) per ton of ore.

SODEMI was also a joint-venture partner in the Ivory Coast Syndicate (ICS) with Eden Roc Mineral Corp. of Canada. ICS began investigations in the Aboisso region, along the southeastern border with Ghana, in 1981. Several areas of mineralization have been discovered in the Afema shear zone, which follows the contact between volcanic formations and their associated sedimentary rocks. The most promising of these mineralized zones was the Asupiri 1 Zone. Three years (1985-87) of drilling the deposit to a depth of 346 meters had outlined ore reserves of 2.34 million tons averaging 6.2 grams (0.20 ounce) of gold per ton. By yearend, ICS had requested from the Government a permit to develop the project.

La Cie. Minière de la Côte d'Ivoire (COMICI) reported production of 2,572 grams (80 ounces) of gold from a small placer deposit at Carichy in the region of Tabou. The deposit was worked by artisanal methods between July 1986 and November 1987.[4]

Industrial Minerals.—Exploration of diamonds by SODEMI, using a portable washing plant, located a promising diamondiferous zone at Séguéla in the Bobi region. A pilot treatment of 908 cubic meters of ore yielded 247 gem-quality stones with a total weight of 255 carats. An estimated 90% recovery was achieved.

Mineral Fuels.—Production of crude oil decreased about 6% in 1987, with production restricted to the Belier and Espoir offshore fields. Although three companies still held exploration permits, little exploration work had been done in recent years, owing to the small size of the oilfields and the necessity for deepwater exploration drilling.

The Ivory Coast continued to refine its own crude oil, as well as to refine oil on contract for neighboring countries. Two oil refineries were in operation in the vicinity of Abidjan. The larger, owned by the Société Ivoirienne de Raffinage, had capacity for 64,000 bbl/d. Société Multinationale de Bitumes-Abidjan had a refining capacity of just over 10,000 bbl/d, and produced mainly asphalt for domestic use and for export to other West African countries.

MALI

Exploration for and development of gold continued to be the dominant aspect of Mali's mineral industry. Although significant deposits of several other minerals, notably bauxite, iron ore, phosphate rock, and uranium, had been identified, a lack of infrastructure, low world commodity prices, and the arid climate, precluded development of anything except a minor amount of phosphate for domestic use.

Mali's economy was based mainly on exports of agricultural products and showed real growth of approximately 3.5% in 1987. Gold was the only mineral product exported, with reported value of just over $7 million;[5] less than 5% of export revenue. Mali's main trading partners were France, Belgium, the Federal Republic of Germany,

and the Ivory Coast. Mali had experienced a trade imbalance over the last several years and showed a trade deficit exceeding $200 million in 1987. Mali's foreign debt reached $1.7 billion, mostly in the form of bilateral loans, and debt service was equivalent to roughly one-third of export revenue.

The Kalana gold mine was the only official producer of gold, although some gold was mined by artisanal workers. Production at Kalana had averaged about 20,000 ounces per year. It was expected to rise to double that rate by 1990, perhaps topping 50,000 ounces per year at peak capacity. When the mine was opened in 1984, proven reserves were announced of almost 1 million ounces, but further investigations had revealed increased reserves in and around the existing ore bodies.

Société Minière de Loulo, a joint venture between the Government, 51%, and BRGM, 49%, was formed to attempt the mining of the Loulo gold deposit west of Bamako, near the border with Senegal. Reserves were estimated at approximately 160,000 ounces of gold, with production lasting 9 years, beginning in 1989. BRGM and the Government of Mali have been working together since 1978 to discover commercially viable mineral deposits, especially gold and diamond.

In midyear, the Government granted BHP-Utah International Inc., an Australian company, exploration rights to a 1,500-square-kilometer concession in the Bagoe region of southern Mali. BHP-Utah agreed to spend $1.5 million on preliminary exploration, with provision for expansion if results were promising.

Toward yearend, there were reports of the discovery of a significant geochemical anomoly in the Massigui quadrangle near Morila in southwestern Mali. The discovery was made as part of a joint exploration program between the Direction Nationale de la Géologie et des Mines of Mali, and the Bureau de Géologie pour la Cooperation Internationale of Belgium. Unlike most other gold discoveries in Mali, the anomoly was found not at the site of old workings, but over extensively altered Birrimian volcanic-sedimentary rocks. The formation lies at the uppermost extension of the curving Birrimian mineralized belt in which much of Ghana's gold has been discovered.[6]

NIGER

Uranium concentrate continued to be Niger's principal export commodity, despite steadily diminishing production over the last 6 years. The only other mineral commodities exported were molybdenum concentrate and tin in the form of cassiterite ore.

Sales of uranium provided more than 80% of total export revenue, and were valued at more than $300 million[7] in 1987. Exports of uranium oxide were reported to be approximately 6,600 tons, more than double the production for the previous year. France was the main market for Niger's uranium, purchasing 5,580 tons of uranium oxide at above-market prices as agreed in a long-term contract. Other purchasers of uranium were the Federal Republic of Germany, Italy, Japan, and Spain. Niger has long-term sales contracts for its uranium, running through 1990, with the member countries in the two uranium mining consortiums.

Production of tin was scheduled to increase in 1987 and to continue increasing through 1991, by which time mine capacity would be almost 200 tons per year, SnO_2 content. Société Minière du Niger had been mining tin at several minor sites in and around the Air Massif, and most of the production was shipped to the Netherlands. Exports were reported to be about 140 tons, valued at just under $1 million. Niger had been stockpiling cassiterite ore while awaiting improved world tin prices.

Production of molybdenum, as a byproduct of uranium mining, had been dwindling since 1980, the first full year of production. Capacity was still listed at 400 tons per year of concentrate containing 35% Mo; metallurgical problems at the treatment plant were blamed for the low metal content of the output.

SENEGAL

As in years past, phosphate mining was the only significant factor in the Senegalese minerals industry. As a result of a worldwide drop in demand for fertilizers, export earnings from phosphates dropped, despite a minor increase in production. Export earnings from phosphate rock, clinker, and attapulgite mining were almost $66 mil-

lion,* and export earnings from manufactured phosphate fertilizers and related chemicals were just over $66 million. These sources accounted for about 16% of Senegal's export revenues.

E. I. du Pont de Nemours & Co. Inc. conducted preliminary exploration for titanium (ilmenite) sands and was engaged in negotiations with the Government of Senegal for related long-term exploration and mining rights. Senegal's titanium sand reserve potential was considered to be large.

COMMODITY REVIEW

Industrial Minerals.—Phosphate was produced by two mining concessions: Cie. Sénégalaise des Phosphates de Taïba (CSPT) and Société Sénégalaise des Phosphates de Thiès (SSPT). Phosphate demand decreased worldwide, and the resulting drop in prices led to a small drop in Senegal's export revenues despite the fact that the country managed to increase its phosphate exports slightly. As in previous years, the phosphate industry in Senegal was hurt by the very high cost of electricity, which represented more than 25% of the phosphate production costs, and by relatively high costs of transport to its major customers in the European Economic Community (EEC). These costs were far lower for its major phosphate-exporting rivals Algeria and Morocco. The major destinations of Senegalese phosphate rock remained the EEC, Japan, India, Yugoslavia, the Philippines, Uruguay, and the Republic of Korea. Senegalese phosphate rock has a high cadmium content, and phosphate exports to the EEC were threatened by proposed legislation governing the cadmium content of fertilizers. The Government of Senegal appealed to the EEC for further studies on the environmental effects of cadmium before imposing a ban on Senegalese phosphate. The world market for manufactured phosphate products also declined in 1987. As a consequence, local sales of phosphate rock to Industries Chimiques du Senegal dropped by about 7% to about 529,000 tons.

The market for aluminum phosphate remained relatively strong, and its producer, SSPT, increased production in 1987 by almost 46% to about 191,000 tons. Clinker production by SSPT rose by about 47% to almost 89,000 tons. Similarly, attapulgite production by SSPT rose by 35% to about 111,000 tons.

Mineral Fuels.—Four companies were actively engaged in oil exploration in both onshore and offshore concessions. While several favorable geologic structures were identified and explored, no oil discoveries were announced.

TOGO

In 1987, the Togolese mineral industry accounted for about 12% of Togo's annual gross domestic product. The mineral sector was dominated by phosphate production, which represented about 27% of the country's export earnings. In 1987, all mineral plants in operation in Togo increased their production.

COMMODITY REVIEW

Industrial Minerals.—*Cement.*—The 1987 cement production of about 370,000 tons represented a 6% increase. As had been the case since the closure of the local clinker plant in 1984, cement production relied entirely on imported clinker. Clinker imports amounted to about 341,000 tons, of which about 313,000 tons was used in cement production. Clinker imports were from Spain, Greece, the German Democratic Republic, and Belgium. Ciments du Togo (CIMTOGO) sold about 374,000 tons of cement in 1987, of which about 111,000 tons was exported to Benin, Burkina Faso, Mali, Ghana, and Gabon. These exports represented a 13% increase over 1986 levels, while local sales increased by 4%. Total cement sales in 1987 amounted to about $62.8 million.*

Marble.—The Société Togolaise de Marbrerie et de Matériaux (SOTOMA) was restructured in late 1986, at which time the Togolese Government's ownership was reduced from 67% to 39%, with the remainder of the company being owned by CIMTOGO (24%) and A/S NORCEM of Norway (37%). The restructured company, Nouvelle SOTOMA, produced about 10,800 square meters plus 808 tons of marble in 1987. This production was more than double the production in 1986, but still represented a level well below the company's capacity of 250 square meters per day. The company exported about 3,400 square meters plus 125 tons of marble to Benin, Ghana, and the Ivory Coast.

Phosphates.—Phosphate remained Togo's most important mineral resource. In 1987, the Government-owned phosphate mining and marketing company, Office Togolais des Phosphates (OTP), produced about 2.5 mil-

lion tons of phosphate, which represented about 69% of the company's production capacity. OTP exported about 2.4 million tons; a 9% increase over 1986 exports. The International Monetary Fund estimates that Togo's 1987 phosphate exports were worth about $81.7 million. Because of European concerns over the high cadmium content of Togolese phosphate, it was expected that future foreign demand for Togolese phosphate would weaken. Togo continued to experience difficulty in attracting financing for its $500 million Kpeme phosphate project, which would involve the construction of a phosphoric acid plant and a triple superphosphate plant, and the development of a new phosphate mine at Dagbati.

Metals.—In 1984, as part of a general privatization policy, a 10-year lease was signed between U.S. private investor John Moore and the Government of Togo. The investor took control of the closed Government-owned steel mill, and converted it to produce finished products from imported semifinished products and scrap, including railroad steel. The mill resumed production at the end of 1984 under the name Société Togolaise de Sidérurgie (STS). It produced high-quality rebar for both the local market and for export. In 1987, STS produced about 12,000 tons of rebar, valued at about $6.95 million, of which about 4,000 tons was exported. The 1987 production was a 36% increase over that of 1986.

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[1]Physical scientists, Division of International Minerals.

[2]Where necessary, values for Guinea-Bissau have been converted from Guinean Pesos at the rate of 561 pesos = US$1.00.

[3]Where necessary, values for Ivory Coast have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF302 = US$1.00. The official CFAF exchange rate was maintained and freely convertible at 50 CFAF per French franc.

[4]Mining Magazine (London). V. 158, No. 5, May 1988, pp. 392-396.

[5]Where necessary, values for Mali have been converted from CFAF to U.S. dollars at the rate of CFAF302 = US$1.00.

[6]Mining Journal (London). V. 309, No. 7947, Dec. 11, 1987, p. 477.

[7]Where necessary, values for Niger have been converted from CFAF to U.S. dollars at the rate of CFAF302 = US$1.00.

[8]Where necessary, values for Senegal have been converted from CFAF to U.S. dollars at the rate of CFAF302 = US$1.00.

[9]Where necessary, values for Togo have been converted from CFAF to U.S. dollars at the rate of CFAF302 = US$1.00.

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